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Artificial intelligence chatbots in nursing education: a scoping review protocol

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ABSTRACT

Introduction: The rapid integration of digital technologies and artificial intelligence systems in education has reshaped teaching and learning processes, enhancing personalization, interactivity, and learner autonomy. In nursing education, artificial intelligence -based educational chatbots have emerged as promising tools capable of simulating clinical situations, supporting critical thinking, and providing individualized feedback; however, the literature remains fragmented regarding their pedagogical applications, benefits, and challenges.
Objectives: To map and synthesize the existing evidence on the use of artificial intelligence -based chatbots in nursing education and professional development, identifying their applications, potentialities, limitations, and gaps in the current knowledge.
Methodology: This scoping review will follow the Joanna Briggs Institute methodology and be reported in accordance with the PRISMA-ScR guidelines. Comprehensive searches will be conducted across major databases and grey literature sources, with no restrictions on language or publication date. Studies addressing the development, implementation, evaluation, or perception of chatbot use in formal or non-formal nursing education will be included. Study selection and data extraction will be performed independently by two reviewers.
Conclusion: The findings are expected to provide a broad and detailed overview of the current evidence on educational chatbots in nursing education, supporting pedagogical innovation, guiding the development of more effective educational technologies, and informing future research focused on strengthening nursing education and professional training mediated by artificial intelligence.

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RESUMO

Introdução: A rápida incorporação de tecnologias digitais e sistemas de inteligência artificial na educação tem transformado profundamente os processos de ensino-aprendizagem, promovendo uma aprendizagem personalizada, interativa e autónoma. Na formação em enfermagem, ferramentas como os *chatbots* educativos baseados em inteligência artificial podem simular situações clínicas, apoiar o raciocínio crítico e fornecer feedback individualizado, contudo, a evidência não é clara quanto às áreas de aplicação, estratégias pedagógicas e desafios envolvidos.
Objetivos: Mapear e sintetizar a evidência existente sobre o uso de *chatbots* baseados em inteligência artificial na educação e no desenvolvimento profissional em enfermagem, identificando aplicações, potencialidades, limitações e lacunas na evidência científica.
Metodologia: Trata-se de um protocolo para uma revisão de escopo seguindo a metodologia do Joanna Briggs Institute que será reportada conforme as diretrizes PRISMA-ScR. Serão realizadas pesquisas abrangentes em bases de dados e literatura cinzenta, sem restrição de idioma ou ano de publicação, incluindo estudos que abordem o desenvolvimento, implementação, e/ou avaliação da utilização de chatbots em contextos formais e não formais de ensino em enfermagem. A seleção e a extração dos dados serão realizadas por dois revisores de forma independente.
Conclusões: Espera-se que esta revisão forneça uma compreensão abrangente sobre o uso de chatbots educativos no ensino de enfermagem, contribuindo para orientar inovações pedagógicas, apoiar o desenvolvimento de tecnologias educacionais mais eficazes e direcionar futuras investigações com vista à melhoria do ensino de enfermagem e da prática profissional mediadas por inteligência artificial.

Introduction

The contemporary educational landscape has increasingly valued lifelong learning, driven by social, technological, and economic transformations that redefine how knowledge is produced, accessed, and applied.[1] In this context, emerging technologies, such as simulators, virtual assistants, and systems based on artificial intelligence (AI), have been naturally incorporated into everyday educational and professional life, impacting not only teaching and learning processes but also the ethical, relational, and subjective dimensions involved in human development.[2]

AI has established itself as one of the most disruptive and versatile technologies today, with applications across various sectors, from industry and finance to health and education. AI, a term introduced by John McCarthy in 1955, broadly refers to the ability of machines to perform tasks that typically require human intelligence, including image recognition, decision-making, and natural language processing.[3–5] Its ability to process large volumes of data, learn from patterns, and offer adaptive responses contributes to optimizing processes and creating innovative solutions that transform the way we live, work, and learn.[6] In the field of education, advances in Digital Information and Communication Technologies (DICT) - such as computers, tablets, and mobile devices - have enabled more dynamic and interactive learning experiences, in which AI stands out for its ability to personalize teaching and promote more autonomous, engaging, and effective learning.[6]

In the field of health education, the integration of AI has proven to be a crucial strategy for training qualified professionals who can effectively navigate complex and rapidly evolving clinical contexts.[7,8] Intelligent tools, such as Intelligent Tutoring Systems (ITS), simulators, and adaptive platforms, enable the replication of real-world situations and the delivery of personalized feedback, thereby fostering the development of both technical and cognitive skills.[9,10] In this way, AI supports the development of more contextualized and safer health education practices, fostering the acquisition of clinical competencies and enhancing decision-making skills.[9]

In nursing, the continuous evolution of care practices, rapid technological progress, and increasing healthcare demands make it essential for both professionals and students to regularly update their knowledge and actively engage in ongoing professional development. Nursing education must therefore go beyond the acquisition of technical skills,

incorporating the development of critical, reflective, and evidence-based decision-making skills capable of sustaining safe, ethical, and patient-centered care.[11]

In this scenario, educational technologies, especially those mediated by AI, emerge as innovative resources in nursing education and training. Among these, chatbots stand out, which are computer systems capable of simulating human interactions and promoting dynamic, interactive, and personalized learning experiences.[12] Many contemporary chatbots are powered by generative artificial intelligence - a subset of AI that creates new content, such as text, images, or audio, based on learned patterns - allowing them to deliver more adaptive, context-aware, and human-like responses in educational settings. [13,14]

These AI-driven chatbots are based on advanced natural language processing techniques, especially Large Language Models (LLM). These models rely on deep neural networks to interpret and generate natural language, enabling them to simulate sophisticated human-like interactions and deliver responses tailored to users' specific needs.[15] In the context of nursing education, LLM have been applied to create interactive and personalized learning environments, as evidenced by the development of "Nurse Town," a platform that integrates an LLM for realistic conversations with virtual patients, providing students with more flexible and accessible practice opportunities.[16] Moreover, evidence suggests that integrating AI-driven chatbots into nursing education can strengthen learning outcomes, foster greater learner engagement, and support the development of essential clinical and cognitive skills.[17]

In the field of education, these conversational agents promote the development of clinical reasoning, problem-solving skills, and active student engagement, serving as tools to support theoretical and practical teaching.[18] In addition, AI-based chatbots have also shown promise in continuing education and professional training, supporting knowledge updating, evidence-based practice, and clinical skills training in different nursing contexts.[19,20] Their applicability ranges from reinforcing curriculum content to simulating clinical situations and supporting decision-making, thereby contributing to the training of more autonomous and critical professionals who are prepared for the contemporary challenges of healthcare.

Given these promises, and despite the increasing number of studies in this domain, the literature remains fragmented, underscoring the need for a comprehensive mapping of the available evidence. Scoping reviews offer a robust methodological approach to examine the extent, scope, and nature of research activity on a given topic, as well as to identify knowledge gaps and research priorities.[21,22] A preliminary search of key databases (CINAHL, PubMed, Scopus, and Web of Science) and registries (Open Science Framework and PROSPERO) identified two reviews related to the use of chatbots in nursing education. The first, a systematic review by Zhang et al. (2025), included only qualitative studies and conducted its search in November 2024, without incorporating grey literature.[23] The second, a scoping review by Labrague and Sabei (2025), considered studies published up to 2024 but similarly excluded grey literature sources.[17] Although these reviews provide valuable insights, they do not offer a comprehensive and up-to-date mapping of the evidence, particularly regarding diverse study designs, emerging literature, and grey literature contributions. Therefore, a new scoping review is warranted to capture the full breadth of available evidence, including recent publications and grey literature, and to provide a more complete understanding of how chatbots are being utilized in nursing education.

Given the above, it is pertinent to conduct a scoping review that investigates and maps the use of AI chatbots in nursing education, both in the context of professional training and development for nurses and nursing students at the undergraduate and postgraduate levels. Understanding the state of the art on this topic will inform us to identify the potential, challenges, and gaps in the literature, contributing to the advancement of pedagogical practices and technological innovation in nursing education. Specifically, this review will aim to:

- Identify the areas of the nursing curriculum in which chatbots are being applied.
- Describe how AI chatbots are used, including the pedagogical strategies applied in nursing education.
- Map the main outcomes associated with the use of chatbots in nursing education.
- Identify the main challenges and limitations reported in the integration of chatbots in nursing education.

Methodology

Considering the emerging nature and limited knowledge about the use of AI-based chatbots as educational tools in nursing education and training, a scoping review was defined as the most appropriate methodological approach for this study. This type of review is especially suitable for recent and ongoing topics, where the evidence is diverse, scattered, and presents different methodological designs.[21,24]

The main objective of scoping reviews is to map the existing body of evidence on a given phenomenon, describing the extent, scope, and characteristics of the available research.[25] This methodological approach enables the identification of knowledge gaps, the clarification of key concepts, and a comprehensive understanding of the existing evidence base. In doing so, it provides valuable guidance for shaping future research priorities and informing the development of innovative teaching and learning strategies.[26,27]

This review will be conducted in accordance with the methodological recommendations of the Joanna Briggs Institute (JBI) and reported in accordance with the

PRISMA guidelines for scoping reviews (PRISMA-ScR), ensuring transparency, rigor, and reproducibility. This review protocol has been prospectively registered on the Open Science Framework (OSF) platform (Registration DOI: https://doi.org/10.17605/OSF.IO/PKVAF).

Review Question

To develop the research question, we adopted a strategy that considers the elements of Population, Concept, and Context, represented by the acronym PCC, as recommended by the Joanna Briggs Institute.[25] Thus, the following were defined: P (Population) – nursing students and nurses; C (Concept) – use of AI-based chatbots; and C (Context) – teaching-learning processes and professional training in nursing.

Thus, the research question was formulated as follows: "What evidence is available on the use of AI chatbots in nursing education?" In addition, the review will explore the following sub-questions:

- In which areas or domains of the nursing curriculum have chatbots been implemented?
- How are chatbots being integrated into nursing education, including the pedagogical approaches and strategies employed?
- What educational outcomes have been reported in studies using chatbots in nursing education?
- What challenges or limitations have been documented regarding the use of chatbots in nursing education?

Inclusion Criteria

The eligibility criteria were defined in accordance with the research question and review objectives, structured based on the PCC strategy to guide the selection of studies included in the review.

Participants

This review will consider studies involving nursing students and professionals engaged in teaching, training, or professional development activities. This includes undergraduate and graduate nursing students, as well as practicing nurses participating in continuing education or workplace training programs. Studies exclusively involving patients, caregivers, or the general public will be excluded unless they include an educational or training component relevant to nursing practice.

Concept

This review will focus on the use of AI-based chatbots as an educational tool in nursing. Studies exploring the development, implementation, evaluation, or perceptions of AI chatbot use for nursing teaching, learning, or training will be included. Studies addressing other educational technologies—such as simulators, applications, virtual reality, or e-learning platforms—without the direct involvement of AI chatbots will be excluded.

Context

Nursing education and training environments will be considered, including theoretical and practical teaching, clinical skills development, and professional development. Studies examining the use of AI chatbots in both formal educational settings (undergraduate and graduate programs) and non-formal contexts, such as training courses, refresher programs, or continuing professional development, will be included. Research focusing exclusively on AI applications in clinical care, management, or diagnostic contexts unrelated to teaching and learning will be excluded.

Type of Sources

A wide range of evidence sources will be considered to ensure a comprehensive mapping of the literature. Regarding the type of study, any quantitative, qualitative, mixed methods studies, original articles, case studies, experience reports, review studies, and gray literature, including theses, dissertations, government reports, clinical practice guidelines, and technical reports relevant to the topic, will be included. Other forms of evidence may also be considered, including systematic reviews, conceptual or theoretical articles, expert commentaries, discussion papers, consensus documents, and educational frameworks or curricula. Editorials and letters to the editor will be excluded. Only sources that explicitly address the use of AI chatbots in nursing teaching, learning, or professional development will be included.

Sources published in any language and from all publication years will be considered to provide a thorough mapping of the relevant evidence. The review team has proficiency in English, Spanish, and Portuguese, enabling direct assessment of studies in these languages. For articles published in languages other than English, translations will be arranged as needed to reduce language bias and ensure inclusivity.

Search Strategy

The search strategy will be constructed based on the PCC framework and the reviewers' expertise in the field to determine relevant keywords and subject headings. Following the JBI methodology for scoping reviews, a three-step search process will be implemented.[28]

First, the development of the search strategy for this scoping review was preceded by exploratory research in the PubMed® and Web of Science™ databases to identify relevant indexed terms and keywords. Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS) were used, allowing the recognition of standardized terms and their terminological variations related to the theme. Based

on the analysis of the titles, abstracts, and descriptors of the studies obtained in this preliminary search, synonymous terms and terminological variations relevant to the study topic were identified to broaden the search sensitivity and ensure the comprehensiveness of the available literature.

Based on these findings, a comprehensive search strategy was collaboratively developed by two reviewers, with input from a health sciences librarian. It was subsequently peer-reviewed by a third expert using the PRESS (Peer Review of Electronic Search Strategies) checklist.[29] The full MEDLINE (via PubMed) search strategy is provided in Appendix A.

The search strategies will be developed taking into account the specific features of each database, using a combination of controlled vocabularies (e.g., MeSH, DeCS, when applicable) and free-text terms, connected with Boolean operators (AND, OR). Terms related to the PCC framework will be adapted for each database to ensure comprehensive and accurate retrieval, taking into consideration controlled vocabularies, specific terminology of each database, and free-text options.

The databases selected for the final search were: PubMed® (National Library of Medicine, NLM), Web of Science™ – Main Collection (Clarivate Analytics), Scopus® (Elsevier), CINAHL Complete (EBSCOhost), Cochrane Library, SciELO, Nursing Database (BDENF), Latin American and Caribbean Health Sciences Literature (LILACS), and Spanish Bibliographic Index in Health Sciences (IBECS). To include gray literature material, the following complementary sources will be consulted: OpenAIRE, Open Dissertations, CAPES Thesis and Dissertation Database (BDTD), ProQuest™ Dissertations & Theses Citation Index, and Google Scholar. The reference lists of included studies will be examined, and citation tracking, along with snowballing methods, will be used to capture additional relevant literature. Authors of key studies may be contacted to identify unpublished or ongoing research.

Study/source of evidence selection

The selection of evidence sources will be carried out with the support of Rayyan reference management software (QCRI Systems). After exporting the results obtained from the databases and complementary sources, duplicated records will be automatically detected and manually verified before removal.

Subsequently, two independent reviewers will screen independently the titles and abstracts of the remaining studies against the previously defined inclusion and exclusion criteria. Eligibility decisions will be recorded on the Rayyan platform itself. In cases of disagreement between reviewers, a third reviewer will be consulted to reach a consensus. Potentially eligible texts will then be read in full to confirm their adherence to the eligibility criteria. Only studies that fully meet the inclusion criteria will be selected for the data extraction and synthesis stage.

In line with JBI recommendations, no methodological quality appraisal of the included studies will be undertaken. Scoping reviews aim to map the scope and characteristics of existing evidence rather than assess study rigor or effectiveness.[25,30] This intentional decision allows the inclusion of diverse evidence sources that may offer valuable insights into educational approaches, supporting a comprehensive and methodologically transparent understanding of the topic.

The results of the entire selection process will be presented in the final scoping review using a flow diagram, according to the stages of identification, screening, eligibility, and inclusion, in accordance with the recommendations of PRISMA-ScR.[27,31]

Data extraction

Data extraction from the included studies will be conducted using a structured Microsoft Excel spreadsheet, designed in accordance with the objectives and research question of the review. This spreadsheet will be completed independently by two reviewers, and any discrepancies will be resolved by consensus or intervention by a third reviewer. Appendix B presents the data extraction table to systematize relevant information from the studies included in the review.

The data extraction will capture key information from each source, including the title, authors, publication year, country of origin, study aim and design, population and educational setting, as well as specific details regarding the chatbot type, underlying technology, and implementation platform.

Aspects related to educational purpose, usage strategies, forms of evaluation, as well as results, perceived impacts, advantages, and limitations of the studies will also be recorded. Finally, the table includes recommendations from the authors and a field for reviewer comments, allowing for the systematic organization and comparison of data, facilitating the analysis, synthesis, and interpretation of evidence on the application of chatbots in nursing education.

During the extraction process, the instrument may be adjusted or improved if new variables or relevant information are identified. All modifications made will be described and justified in the final version of the review, ensuring transparency and methodological reproducibility.

Data analysis and presentation

The data extracted from the selected studies will be examined using systematic, descriptive, and analytical techniques to address the review objectives and research questions related to the integration of AI–driven chatbots in nursing education and professional development. The descriptive summary will outline key study features, participant characteristics (students or practicing nurses), educational settings,

chatbot typologies, instructional approaches, and the evaluation strategies or instruments employed.

The findings will be conveyed through a combination of narrative explanations, structured tables, and visual outputs—such as figures, charts, or conceptual diagrams—to depict the distribution, prevalence, and interrelations of central variables, including chatbot functionalities, pedagogical models, content domains, assessed outcomes, and users' reported experiences. Dedicated tables will be organized for each research question to provide a coherent and comprehensive representation of the evidence.

When suitable, a basic qualitative content analysis will be undertaken to identify recurring patterns and thematic categories. These may include reported advantages, challenges encountered during implementation, perceived effects on learning processes and engagement, as well as technological or pedagogical constraints associated with the use of chatbots. This analytical process will facilitate the identification of major trends, points of divergence, and gaps that warrant further investigation.

A narrative synthesis will accompany all tabulated and visual representations, explicitly linking the synthesized evidence to the review aims and guiding questions. This synthesis will clarify how existing initiatives contribute to learning and competency development in nursing, highlighting effective educational practices, opportunities for innovation, and directions for future research.

Instances in which information is missing or not described will be marked as "n/a," ensuring transparency and methodological rigor in accordance with the Joanna Briggs Institute recommendations for scoping reviews.[32,33]

Conclusion

This scoping review protocol outlines a structured and transparent methodological approach to systematically map and synthesize the existing evidence on the use of AI-based chatbots in nursing education. Beyond providing a descriptive overview, the planned synthesis is intended to critically examine how these technologies are shaping contemporary pedagogical practices, learning processes, and competency development within nursing education.

By consolidating evidence on the educational purposes, pedagogical strategies, technological designs, and evaluation approaches associated with chatbot use, this review will contribute to a more nuanced understanding of their role in supporting clinical reasoning, learner engagement, and knowledge acquisition. Importantly, the systematization of findings will allow for the identification of patterns, inconsistencies, and gaps across diverse educational contexts, highlighting where AI-driven chatbots add pedagogical value and where their implementation remains limited or insufficiently theorized.

The results of this review are expected to inform the evolution of nursing education by offering evidence-based guidance for educators, curriculum designers, and institutions seeking to integrate AI technologies in a pedagogically sound and ethically responsible manner. By clarifying the conditions under which chatbots are most effective, as well as the challenges related to usability, evaluation, and integration into curricula, this review may support more strategic and intentional adoption of AI-enhanced learning tools.

Furthermore, identifying methodological and conceptual gaps will help direct future research toward robust evaluation designs, theory-informed educational models, and outcome measures that extend beyond learner satisfaction to include meaningful learning and practice-related outcomes. Ultimately, this scoping review aims to strengthen the evidence base underpinning AI-mediated innovations in nursing education, contributing to the development of more adaptive, learner-centred, and future-oriented educational ecosystems.

Data supporting the results will be provided on request.

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